DOCUMENT RESUME

ED 220 335 SE 039 097

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TITLE Design Lab. USMES "How To" Series.
INSTITUTION Education Development Center, Inc., Newton, Mass.; Unified Science and Mathematics for Elementary Schools, Newton, Mass.
SPONS AGENCY National Science Foundation, Washington, D.C.
REPORT NO ISBN-0-89292-029-7; ISBN-0-89292-031-9
PUB DATE 77
GRANT SED-69-01071
NOTE 31p.; For related documents see SE 039 060-098, ED 142 362, and ED 183 367.
AVAILABLE FROM ERIC Clearinghouse for Science, Mathematics, and Environmental Education, 1200 Chambers Rd., 3rd Floor, Columbus, OH 43212 ($1.75).

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Elementary Education; *Elementary School Mathematics; *Elementary School Science; *Hand Tools; Instructional Materials; Interdisciplinary Approach; Language Arts; Learning Activities; Mathematics Education; *Problem Solving; Process Education; Science Course Improvement Projects; Science Education; Social Studies; *Unified Studies Curriculum; Woodworking
IDENTIFIERS National Science Foundation; *Unified Science Mathematics for Elementary Schools

ABSTRACT

The major emphasis in all Unified Sciences and Mathematics for Elementary Schools (USMES) units is on open-ended, long-range investigations of real problems. Since children often design and build things in USMES, 26 "Design Lab" cards provide information on the safe use and simple maintenance of tools. Each card has a large photograph of the tool or tools on the top. The first frame on most cards is a photograph of a child holding the tool, providing the user with an understanding of how the tool is held. Remaining frames describe important skills in using the tool. Primary grade students or older students with reading problems should find the large photographs/illustrations useful in understanding the material presented with little reliance on accompanying word descriptions. Tools described include: electric tools (saber saw, electric drill, glue gun, soldering gun); handsaws (crosscut, coping, keyhole saws and hacksaw); other hand tools that cut (files, circle cutter, wood chisel, block plane, hand drill); holding tools (pliers, "C" clamp, screwdriver, hammer, size of nails); and measuring tools (combination square, rafter square, level). Additional cards provide instructions for maintaining a saber saw and electric drill and for making a sawhorse, tri-wall slot, and bend in a tri-wall. (Author/JN)

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HOW TO SERIES

USMES
UNIFIED SCIENCE AND MATHEMATICS FOR ELEMENTARY SCHOOLS

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DESIGN LAB

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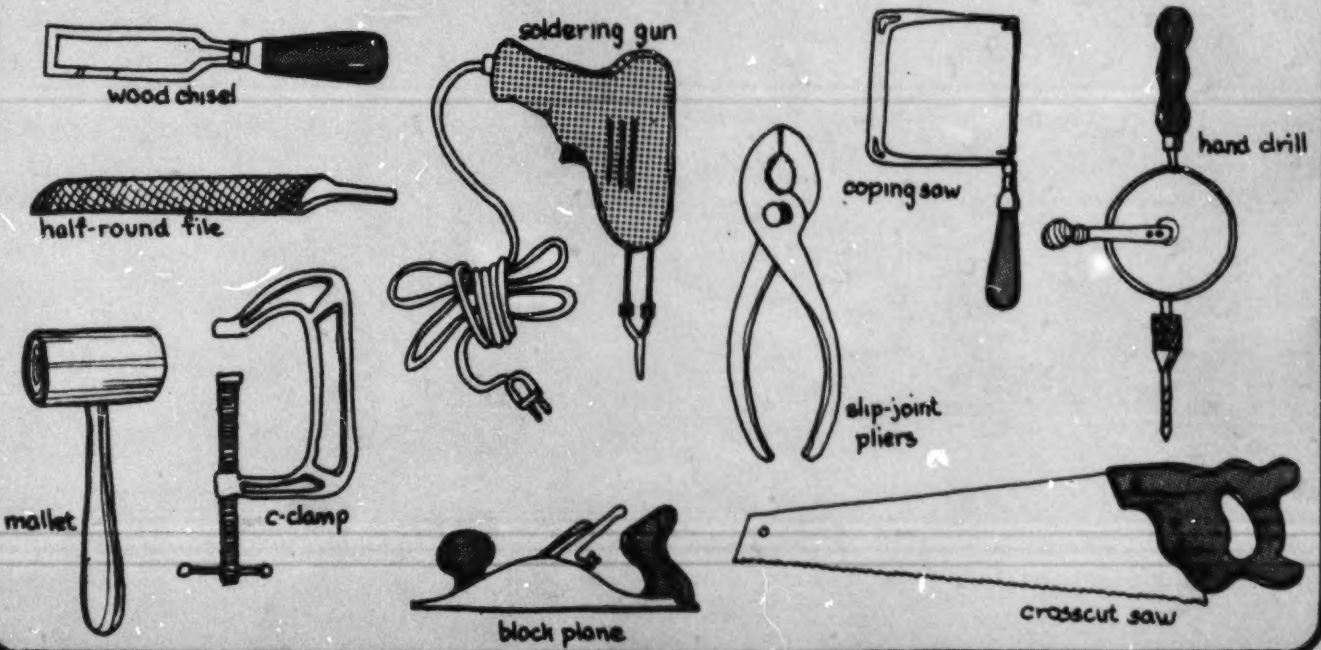

SE 039 097

WHAT IS USMES ?

USMES challenges students to solve real problems within their school and community. Children tackle problems like a busy or unsafe intersection near their school, classroom furniture that doesn't fit them, or playgrounds that are crowded or uninteresting. These problems have immediate and practical impact on students. They have no established, correct solutions--students take or recommend action based upon whatever data they collect and analyze. Furthermore, the children themselves, not the teacher, direct the problem-solving process.

Solving real problems is interdisciplinary: skills, processes, and concepts from science, mathematics, social science, and language arts all play a part. For example, students conduct opinion surveys, build measuring devices, write letters, and make and use graphs. They also make decisions, work productively in small groups, and develop and clarify values.

The USMES curriculum is organized into twenty-six problems, or units, that have been developed in the classroom by teachers and students in a wide variety of schools. Most units can be used in grades K-8 although the level at which students approach a problem and develop a solution will vary according to age, ability, and interest.

RESOURCES FOR AN USMES PROGRAM

In addition to the USMES "How To" Series, there are--

The USMES Guide: This book describes the USMES project, real problem solving, classroom strategies, the Design Lab, the units, and the support materials as well as ways that USMES helps students learn basic skills.

Teacher Resource Books (one per unit): Each of these guides to using USMES units describes a broad problem, explains how students might narrow that problem to meet their particular needs, recommends classroom strategies, and presents logs from teachers whose classes have worked on the unit.

Design Lab Manual: This guide helps teachers and administrators set up, run, and use a Design Lab--a place with tools and materials where students can build things they need for their work on USMES units. A Design Lab may be a corner of a classroom, a portable cart, or a separate room.

Background Papers: These papers, correlated with the "How To" Series, provide teachers with information and hints that do not appear in the student materials.

Curriculum Correlation Guide: By correlating the twenty-six USMES units with other curriculum materials, this book helps teachers integrate USMES with other school activities and lessons.

The "How To" Series is a resource developed by the USMES project: Earle L. Lomon, Project Director, Betty M. Beck, Associate Director for Development, Thomas L. Brown, Associate Director for Utilization Studies, Quinton E. Baker, Associate Director for Administration.

This material is based upon research supported by the National Science Foundation under Grant No. SED69-01071. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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Complete USMES Library ISBN: 0-89292-033-5
Beginning "How To" Series ISBN: 0-89292-029-7

THE USMES DESIGN LAB "HOW TO" SERIES

USMES and Skills

USMES students often see a need to learn new skills to help them get a problem-solving job done. Children seeking to improve a street crossing may want to learn how to use a stopwatch or how to make a trundle wheel. Children comparing different brands of paper towels may want to learn how to design an experiment and how to make a bar graph. The list can go on and on, but the pattern is clear; solving a real problem requires skills.

PURPOSE OF THE DESIGN LAB "HOW TO" SERIES

Children often design and build things in USMES. They may, for example, decide to build tables during a Classroom Design challenge, or they may build testing equipment while working on a Consumer Research challenge. Whatever children decide to build, they will need to have skills with tools. The Design Lab "How To" series provides children information on changing saw blades, doing simple preventive maintenance, and, most importantly, using tools safely.

Primary age children or older children with reading difficulties should find that the large photographs and illustrations make it possible to understand most of the material being presented with little reliance on the accompanying word descriptions.

HOW TO USE THE CARDS

Please look over all the cards in the Design Lab "How To" series before using them with children.

Hanging the Design Lab "How To" Cards on a bulletin board or on the wall near the tools is a good way to make the cards easily accessible to young builders. A clearly marked box or a loose leaf notebook kept near the tools are other good places to keep the cards.

Students should use the Design Lab series as the need arises. Give the students a brief explanation of how the cards can be used and leave the rest up to them (all electrical tools require an adult to be present when students are using tools).

When students do have questions, it might prove useful to know how the cards have been arranged.

- Each card has a large photograph of the tool or tools at the top.
- On most cards, the first frame is a photograph of a child holding the tool. This provides the young user with an understanding of how the tool is held.
- The remaining frames describe important skills in using the tool. Those skills which children have used most frequently have been placed first.
- As much as possible, directions, warnings, and types of arrows, etc., have been consistently used throughout the series. One problem is metric vs. English. Metric is used as much as possible, but lumber and many tools are still only available in the English system.

OTHER USMES 'HOW TO' SERIES

Beginning "How To" series: This series helps children learn skills like designing an opinion survey and choosing the appropriate measuring tool. Its cartoon-style format helps younger children and those with reading difficulties acquire the skills and knowledge they need to do things like redesign their classroom, find the best buy in potato chips, or run a school store.

Intermediate "How To" Series: This magazine-style series covers in more detail essentially the same material as the cartoon-style series with a few booklets on additional skills. This series gives students a chance to read something they have a need to read.

DESIGN LAB "HOW TO" SERIES

ELECTRIC TOOLS

HOW TO

Use a Saber Saw
Use an Electric Drill (Yellow)
Use a Glue Gun
Use a Soldering Gun

HAND SAWS

HOW TO

Use a Crosscut Saw
Use a Coping Saw (Blue)
Use a Keyhole Saw
Use a Hacksaw

OTHER HAND TOOLS THAT CUT

HOW TO

Use a File
Use a Circle Cutter
Use a Wood Chisel (Green)
Use a Block Plane
Use a Hand Drill

TOOLS THAT HOLD

HOW TO

Use Pliers
Use "C" Clamps
Use a Screwdriver (Brown)
Use a Hammer
Find the size of Nails

TOOL MAINTENANCE

HOW TO

Maintain a Saber Saw (gray)
Maintain an Electric Drill

MAKING A...

HOW TO

Make a Sawhorse
Make a Tri-Wall Slot (Orange)
Make a Bend in Tri-Wall

TOOLS THAT MEASURE

HOW TO

Use a Combination Square
Use a Rafter Square (Pink)
Use a Level

Created by Charles Donahoe, Barbara Low, and John Saalfield.

Photography by Jim Byler.

Thanks to the teachers who helped in the evaluation of these cards, and to Frank O'Brien, Wesley Perusek, Ed Manfre, and Peter D. Zevitas for thier technical assistance.

Special thanks to the hands: Kerri Donahoe and Kyle Gore

ISBN: 0-89292-031-9.

HOW TO USE A SABER SAW

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DEMO LAB
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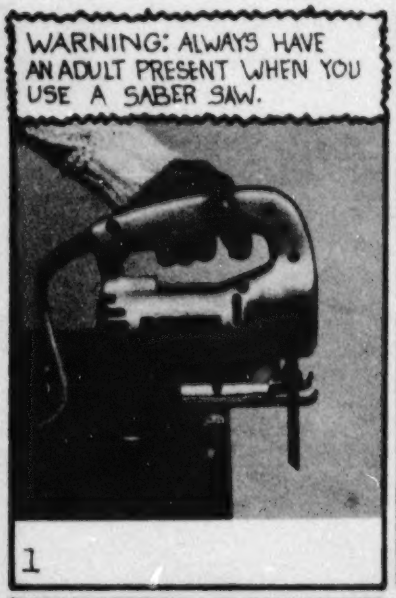

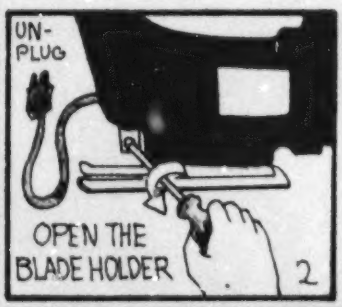

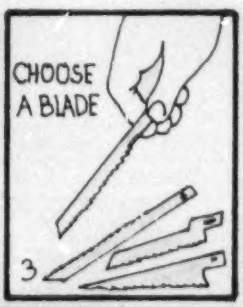

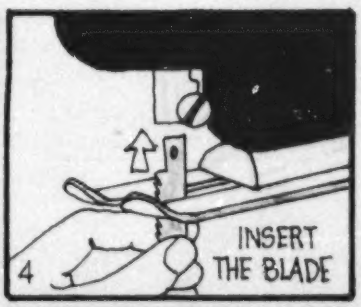

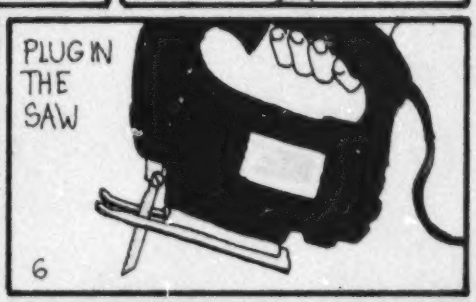

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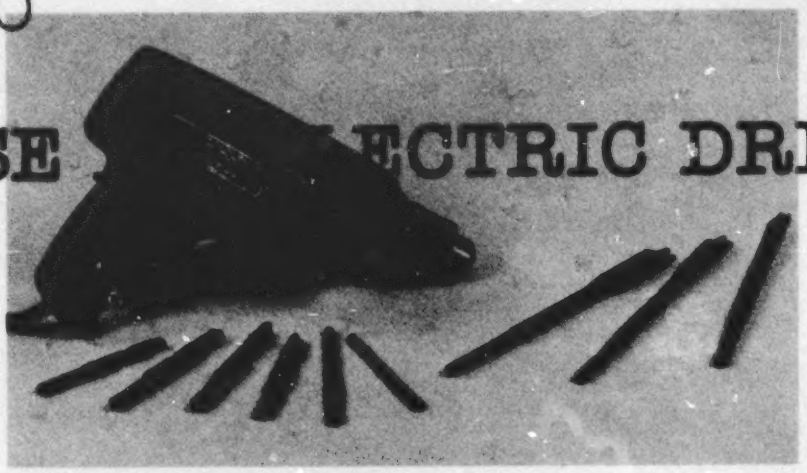
HOW TO USE AN ELECTRIC DRILL



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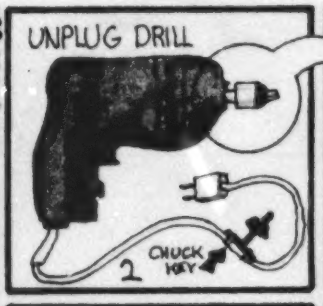

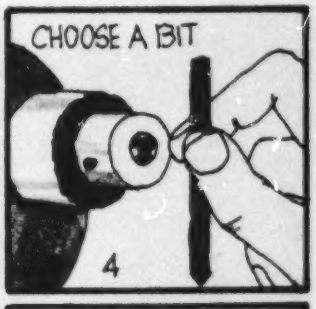

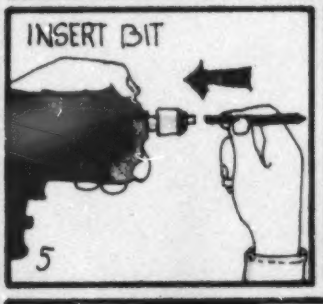

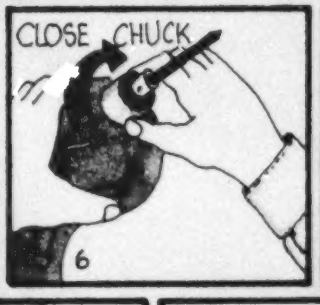

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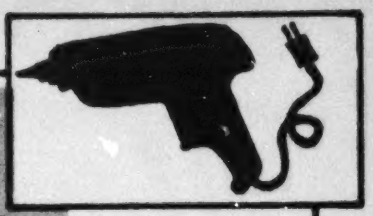

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HOW TO USE A SOLDERING GUN

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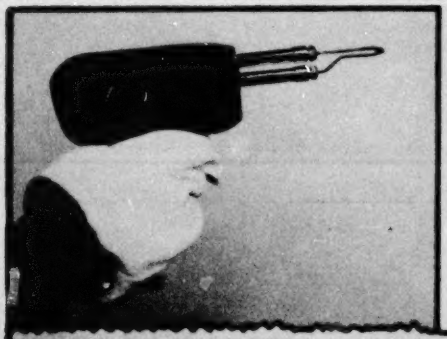
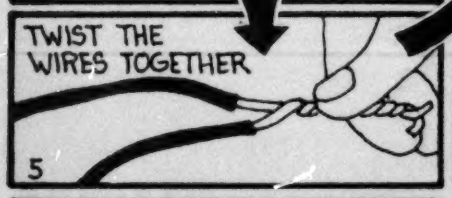
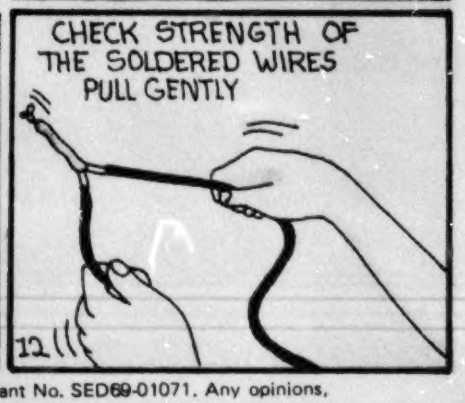


CAUTION: DO NOT TOUCH THE FRONT OF THE SOLDERING GUN!





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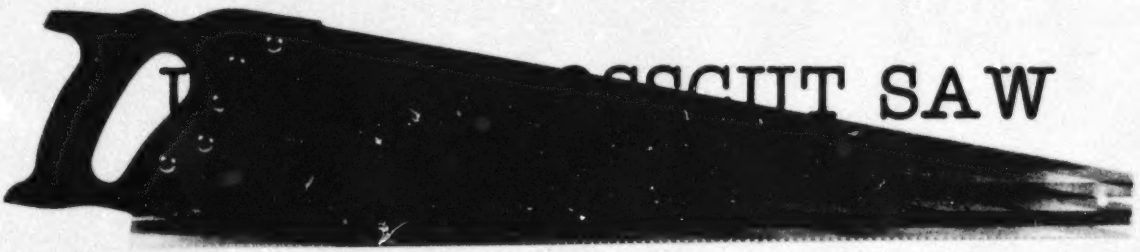
HOW TO



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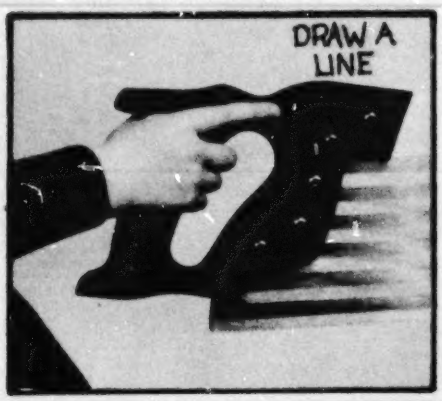

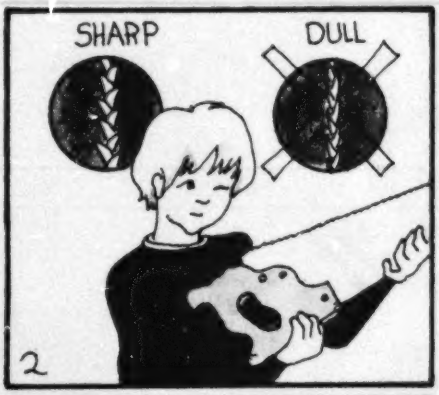

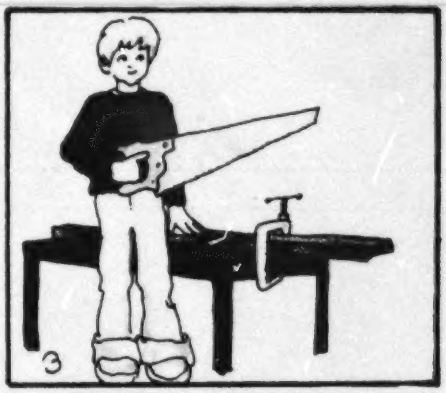

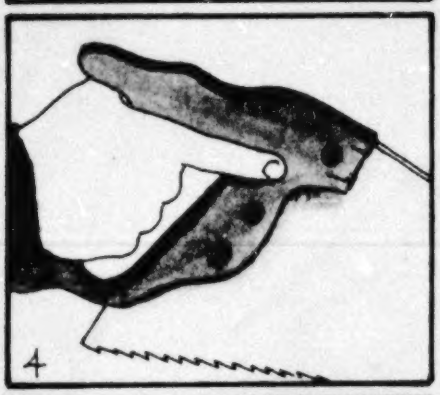

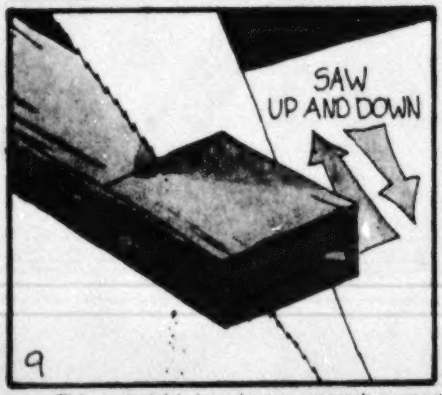

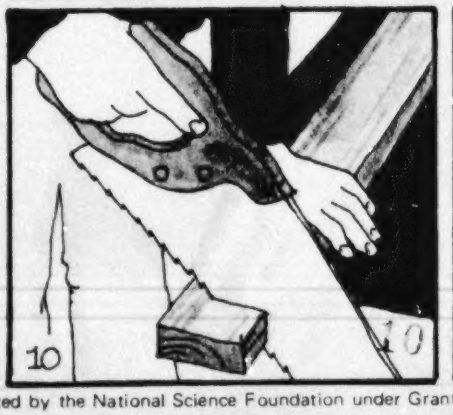

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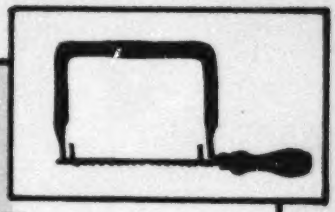
HOW TO USE A COPING SAW



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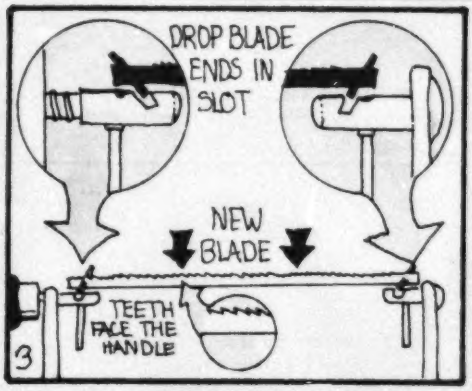

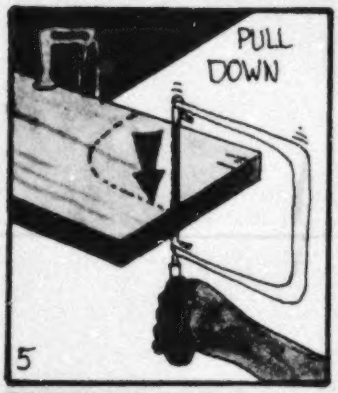

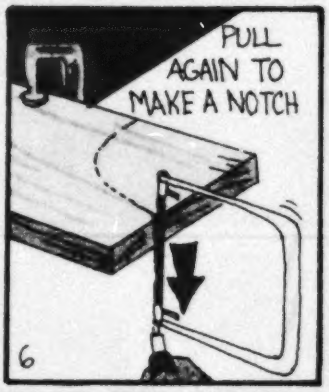

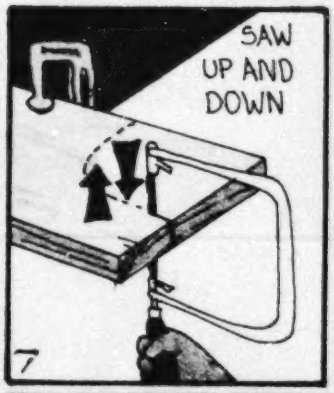

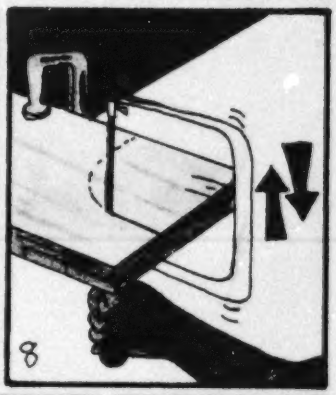

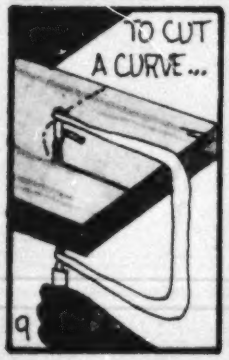

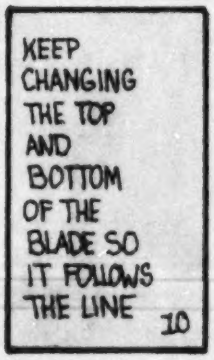

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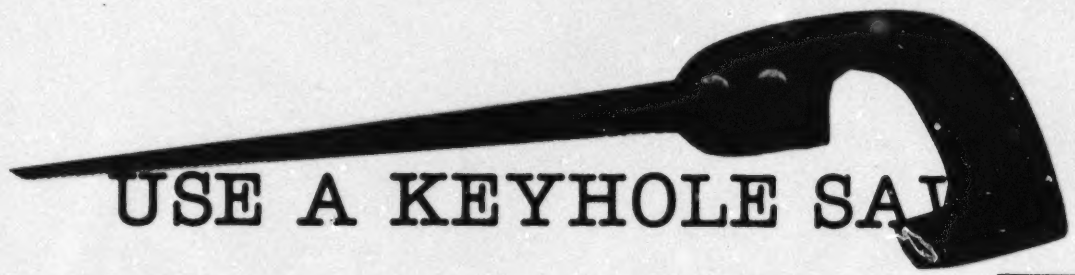
HOW TO



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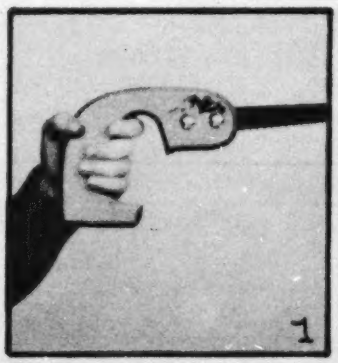

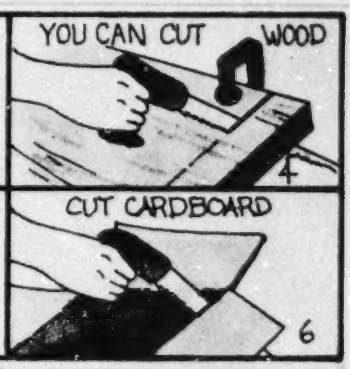

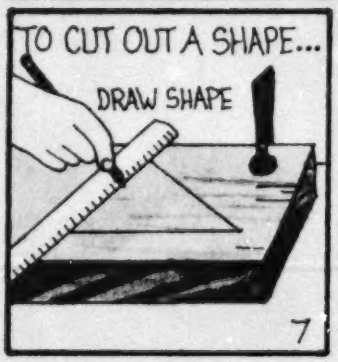

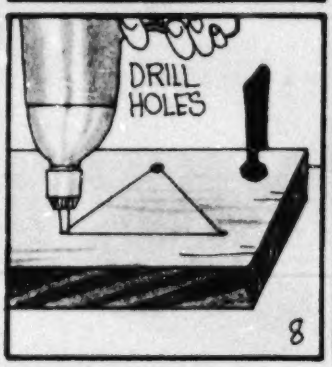

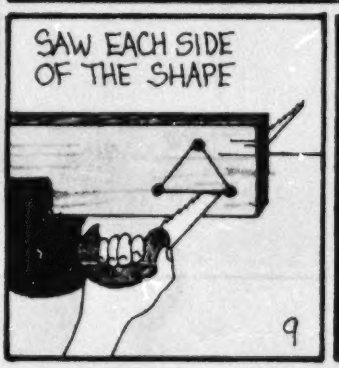

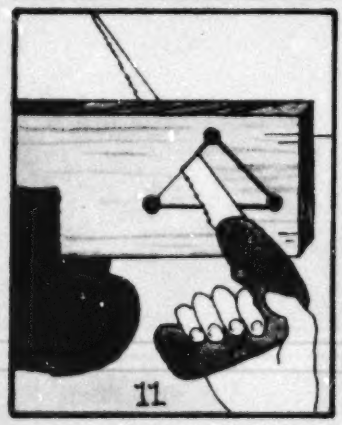

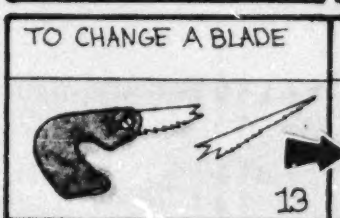

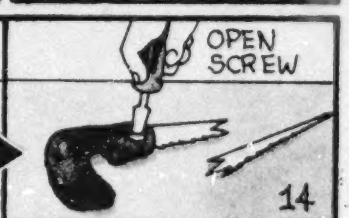

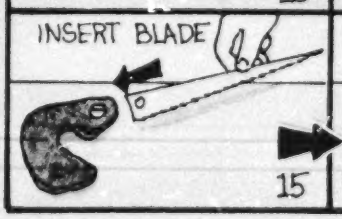

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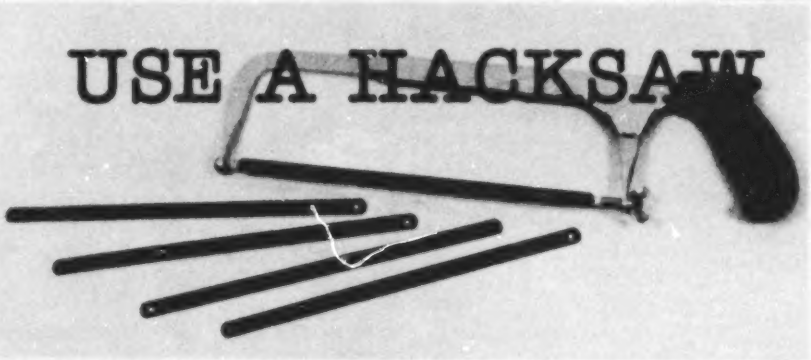

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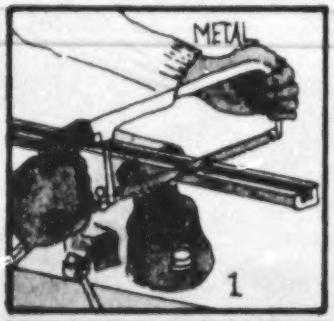

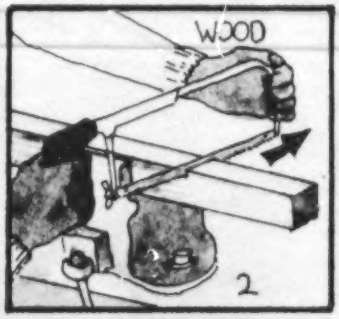

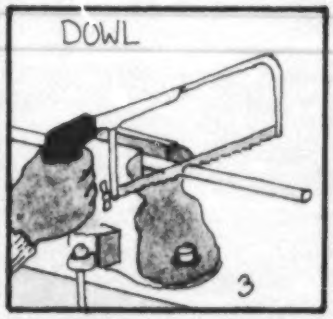

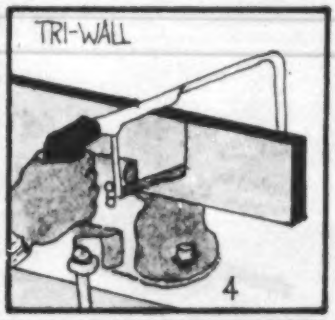

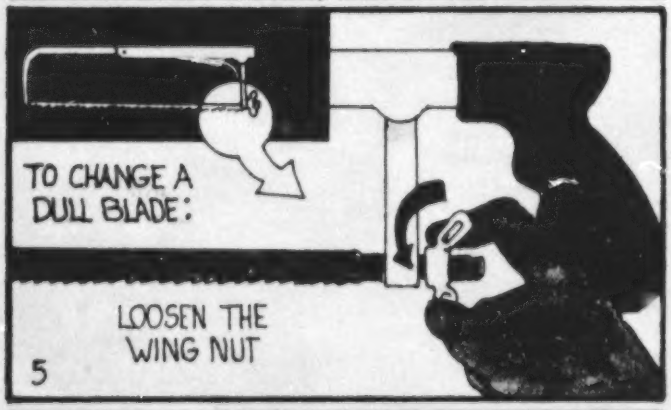

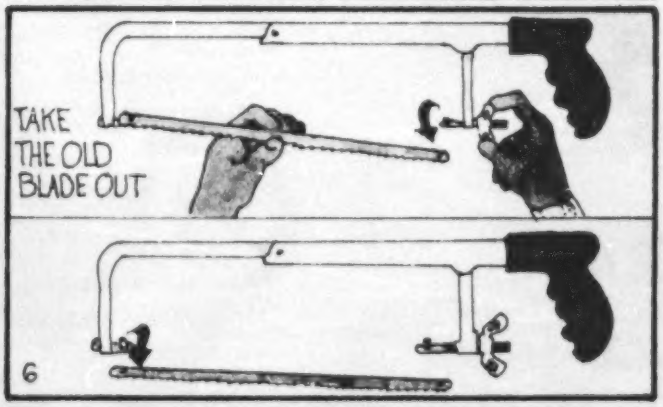

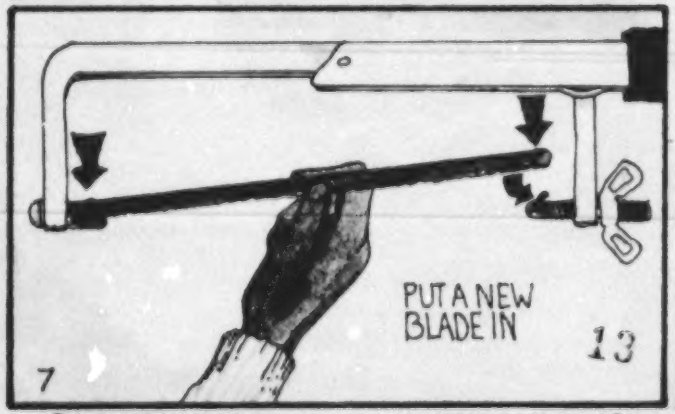

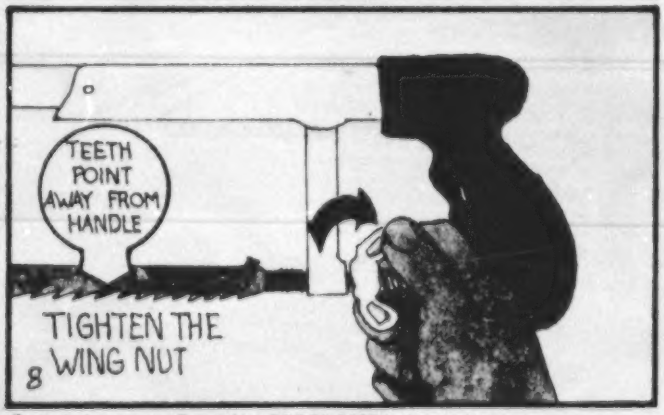

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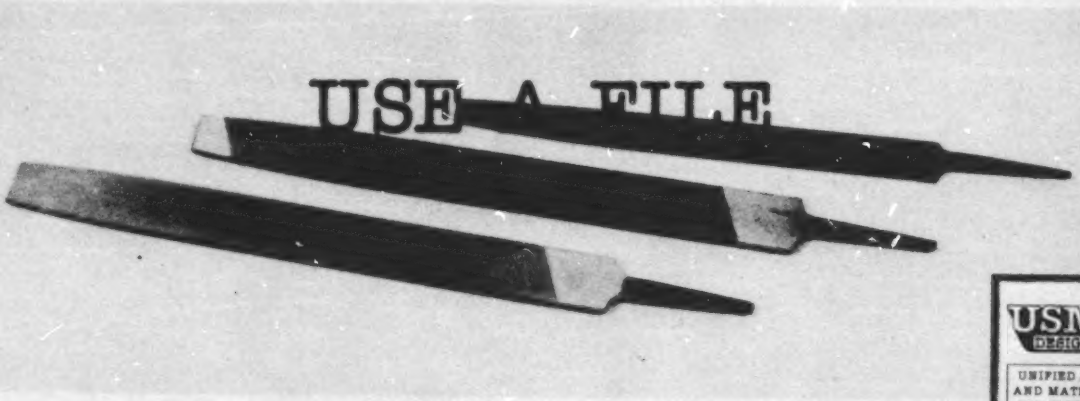

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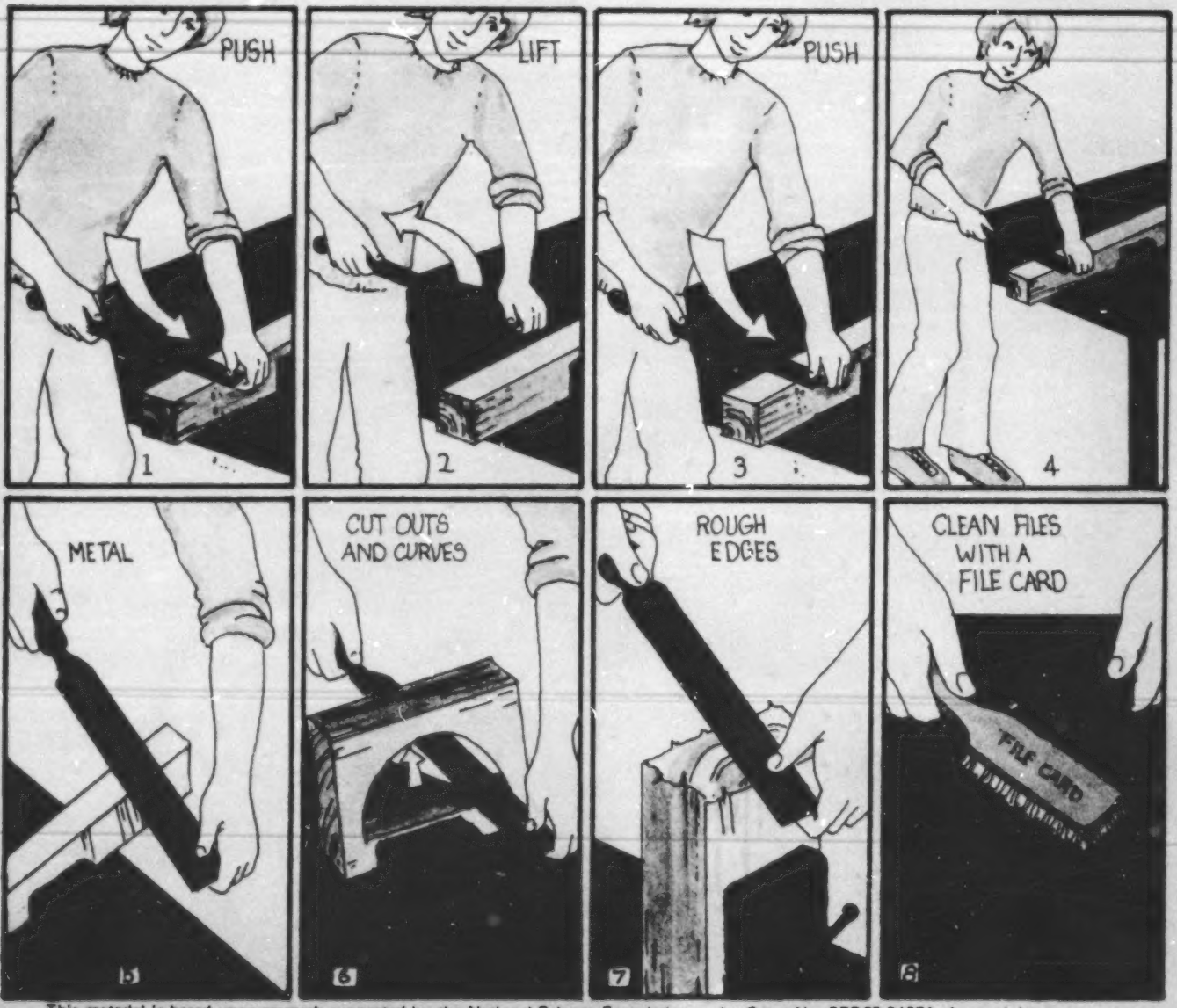

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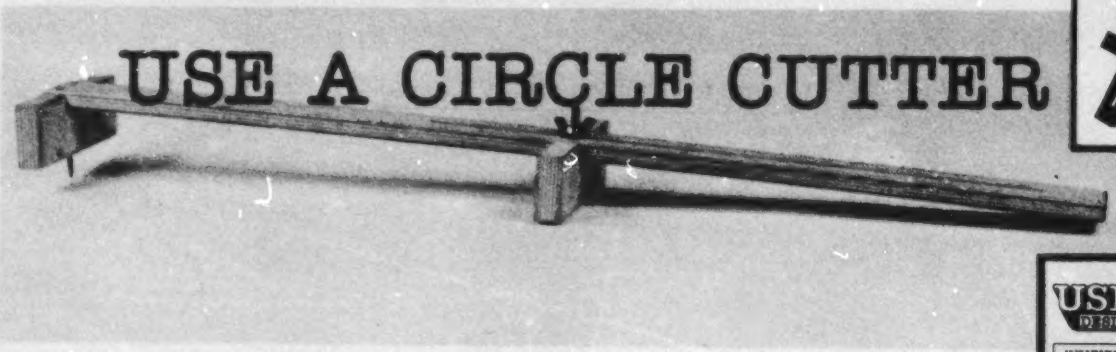

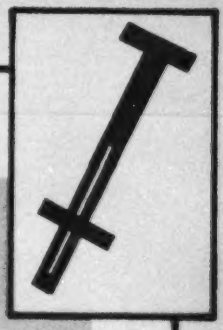

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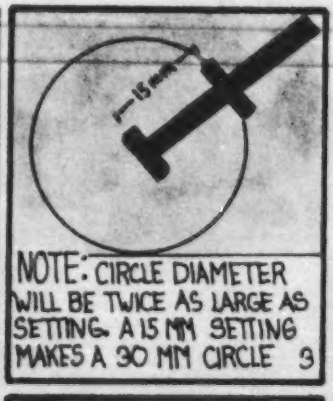

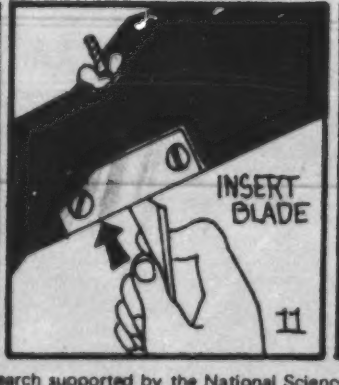

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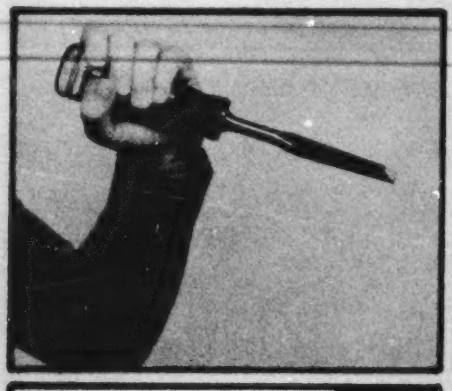

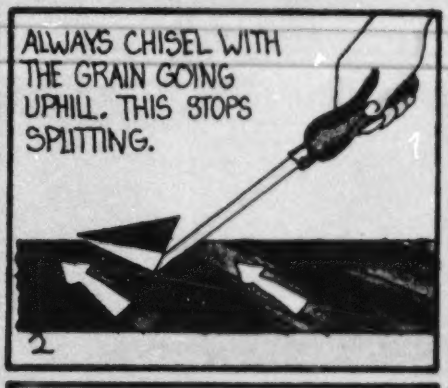

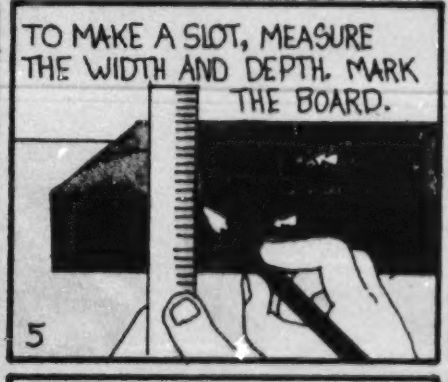

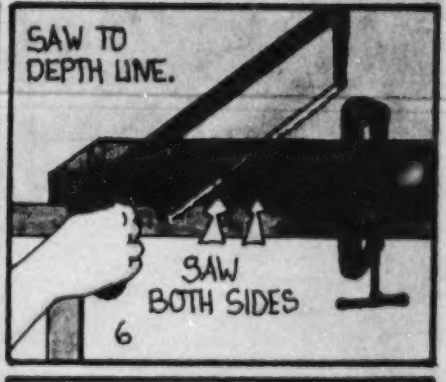

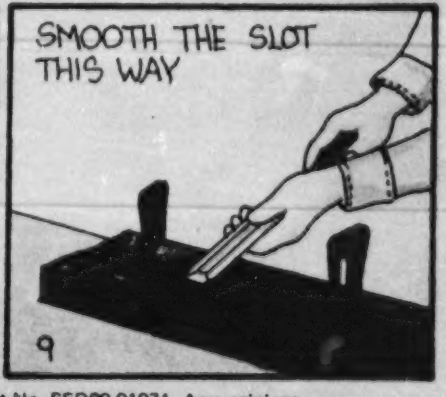

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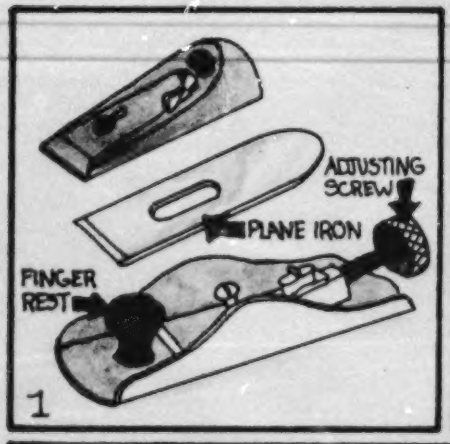

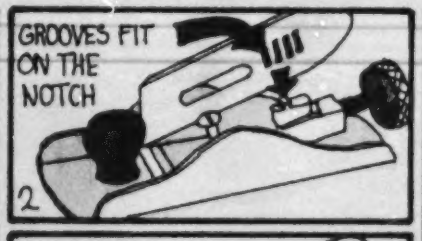

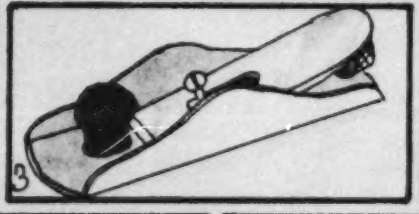

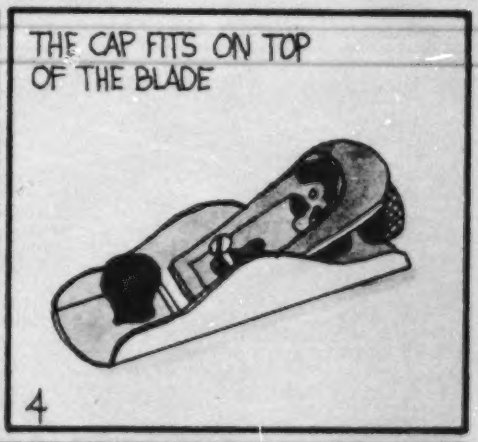

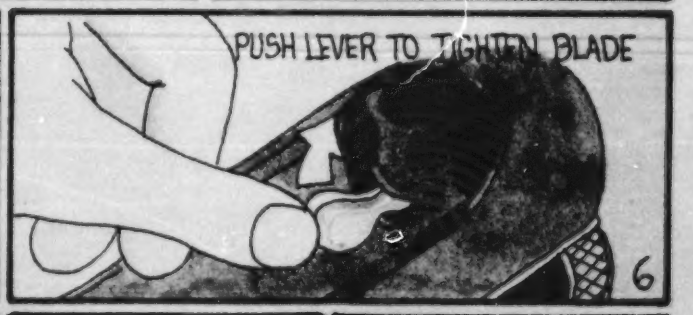

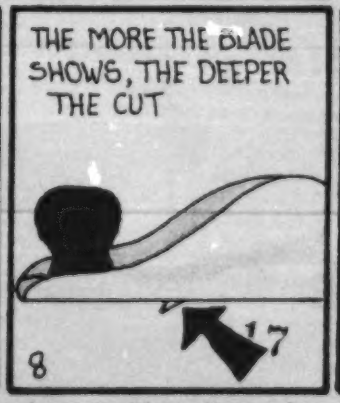

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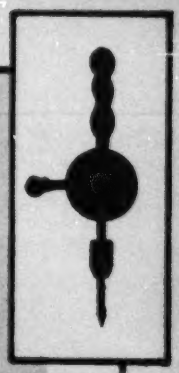

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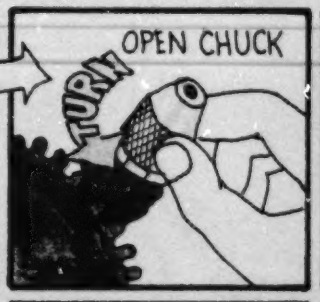

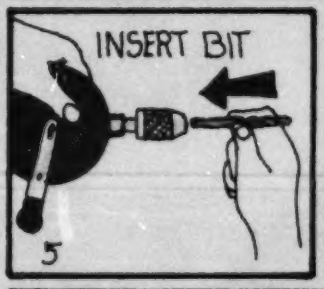

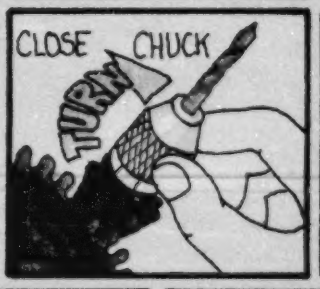

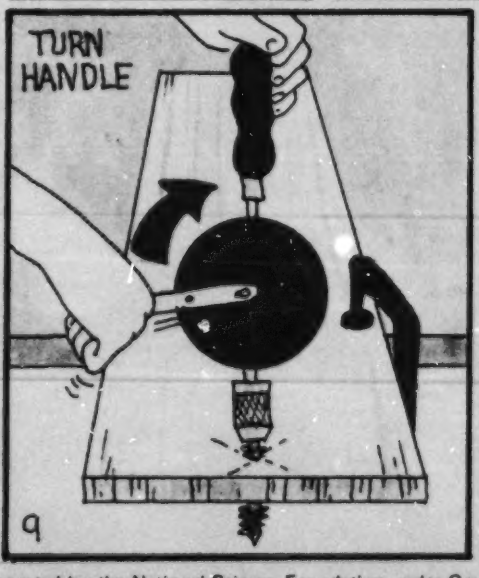

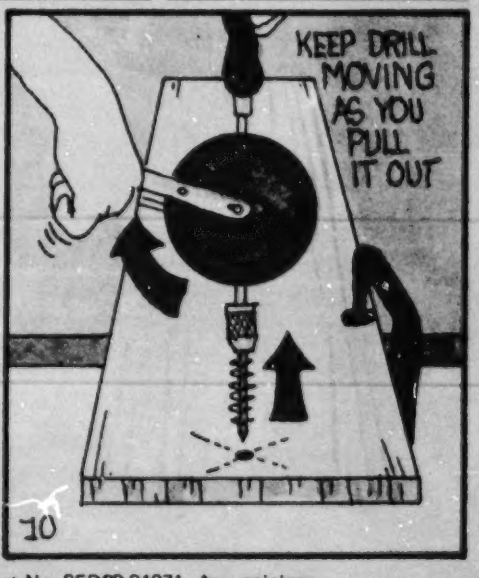

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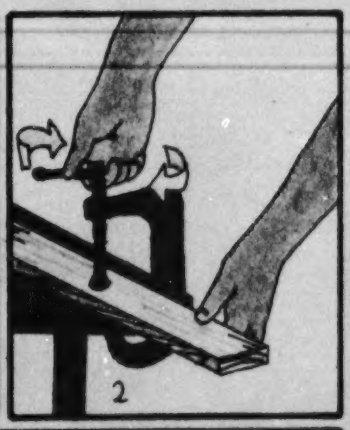

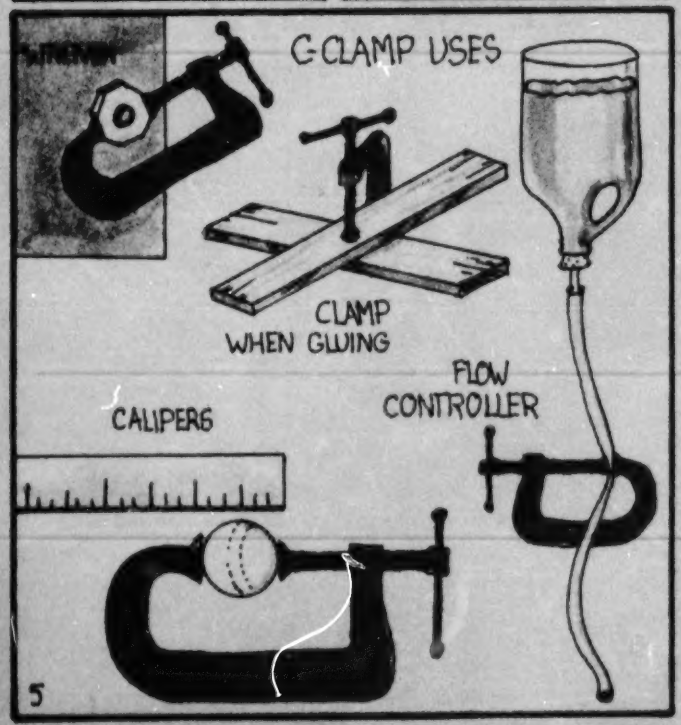

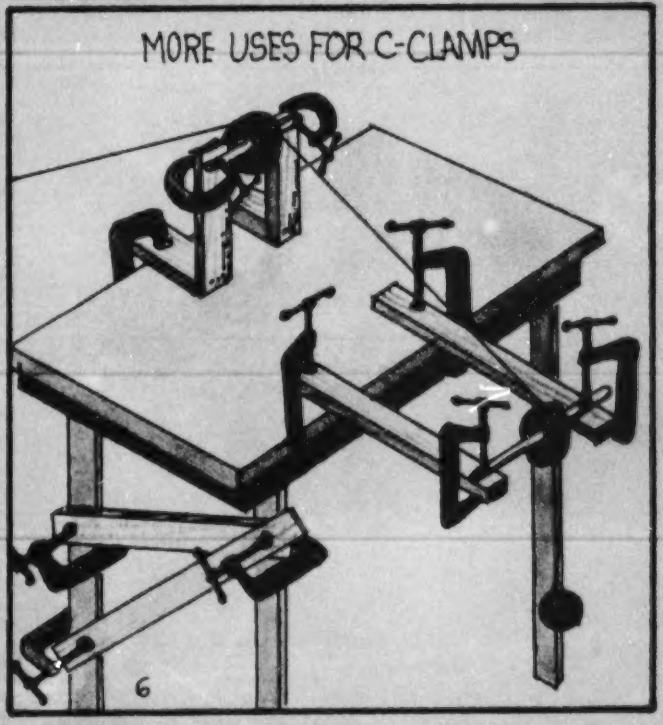

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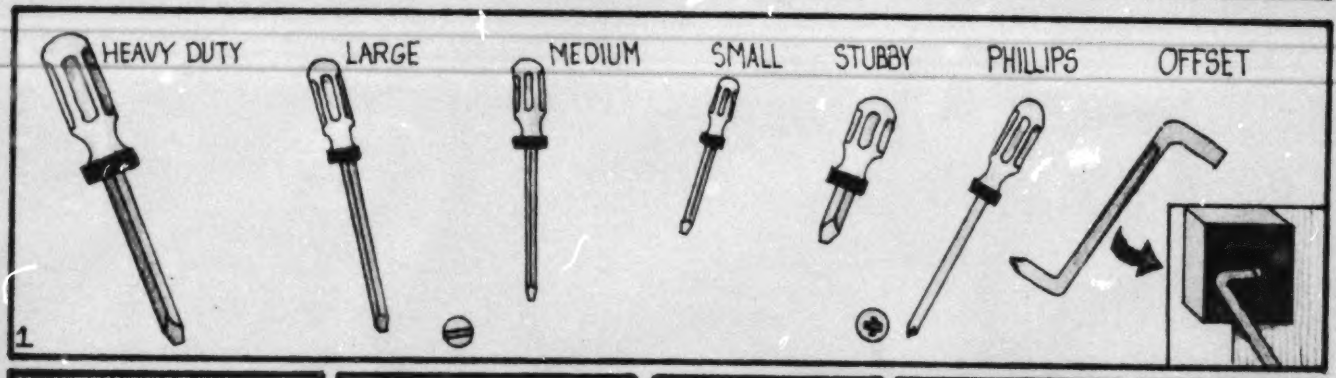

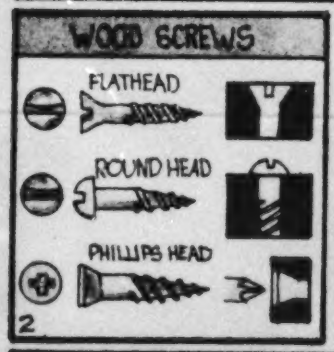

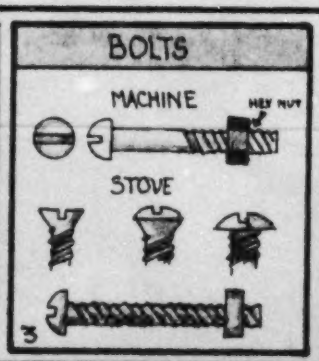

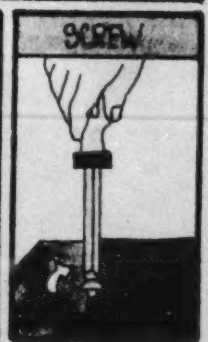

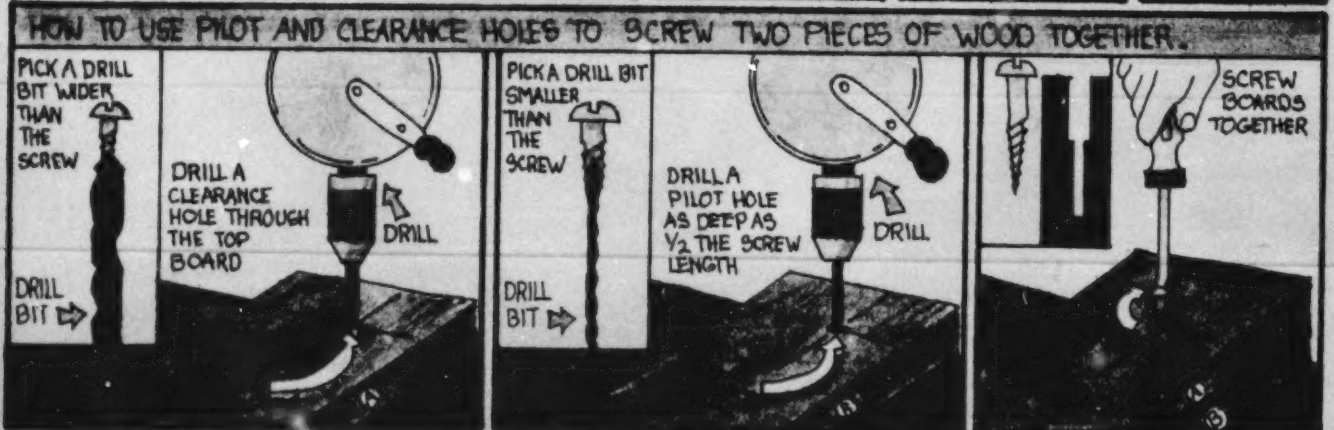
HOW TO USE PILOT AND CLEARANCE HOLES TO SCREW TWO PIECES OF WOOD TOGETHER.
PICK A DRILL BIT WIDER THAN THE SCREW
DRILL BIT
DRILL A CLEARANCE HOLE THROUGH THE TOP BOARD
DRILL
PICK A DRILL BIT SMALLER THAN THE SCREW
DRILL BIT
DRILL A PILOT HOLE AS DEEP AS ½ THE SCREW LENGTH
DRILL
SCREW BOARDS TOGETHER

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HOW TO USE A HAMMER

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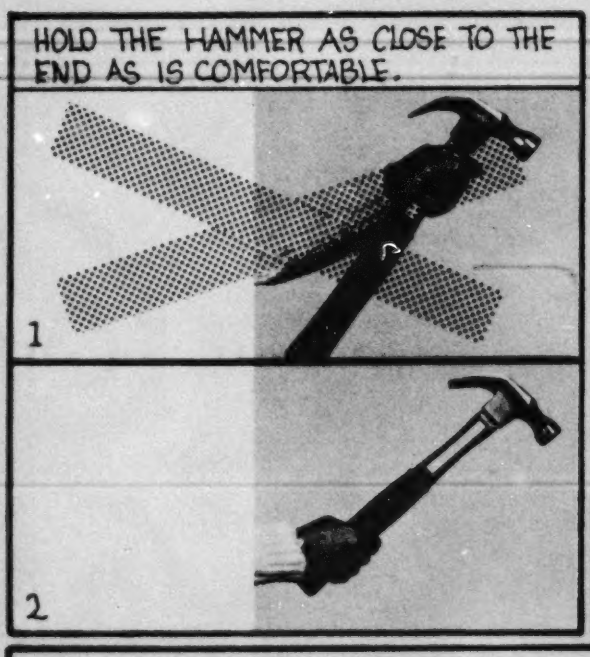

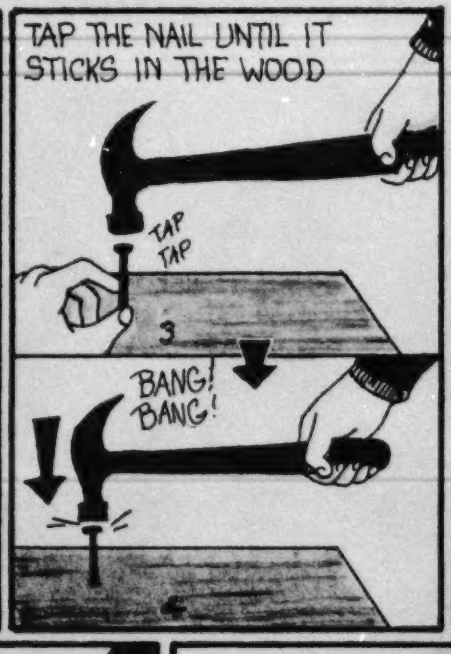

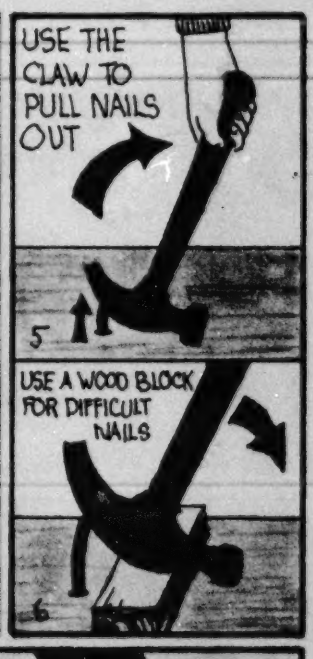

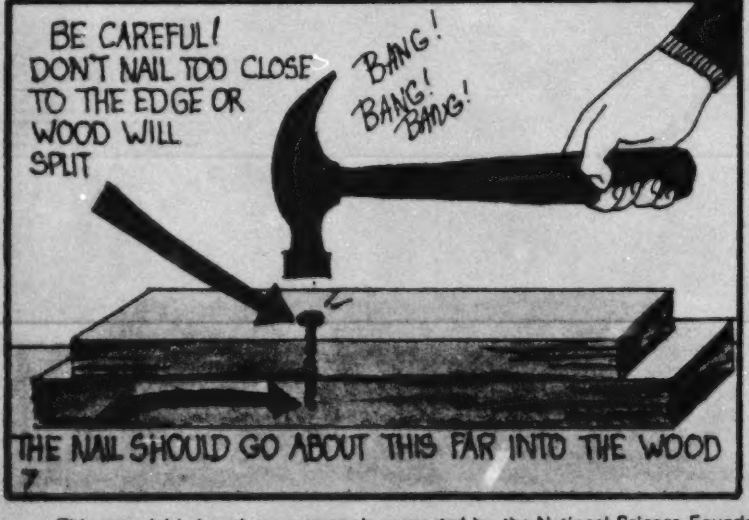
BE CAREFUL! DON'T NAIL TOO CLOSE TO THE EDGE OR WOOD WILL SPLIT
BANG!
BANG!
BANG!
THE NAIL SHOULD GO ABOUT THIS FAR INTO THE WOOD
7

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HOW TO

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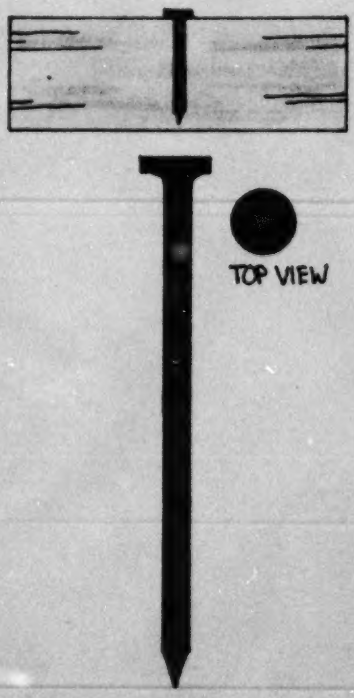
COMMON NAILS

COMMON NAILS HAVE HEADS
USE A COMMON NAIL IF YOU WANT TO TAKE THE NAIL OUT LATER

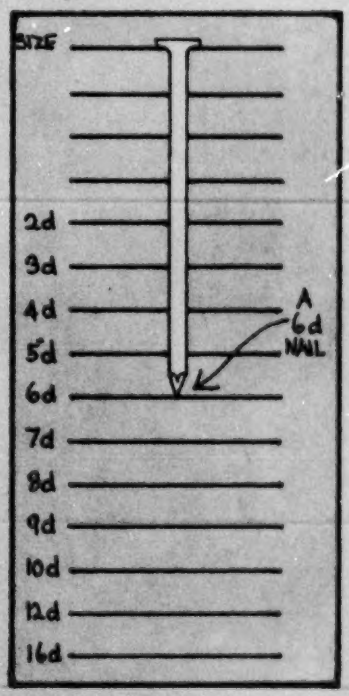


COMMON NAILS ARE CALLED PENNY COMMON NAILS

1

PENNY NAIL GAUGE

IF YOU WANT TO KNOW HOW LONG A NAIL IS HOLD IT UP TO THE NAIL GAUGE CHART

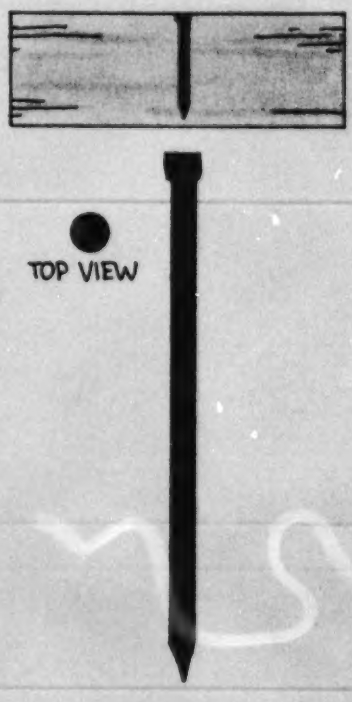


THE LETTER d STANDS FOR PENNY
A 6d NAIL IS CALLED A 6 PENNY NAIL

2

FINISHING NAILS

FINISHING NAILS DO NOT HAVE HEADS
USE A FINISHING NAIL WHEN YOU DO NOT WANT IT TO SHOW



3

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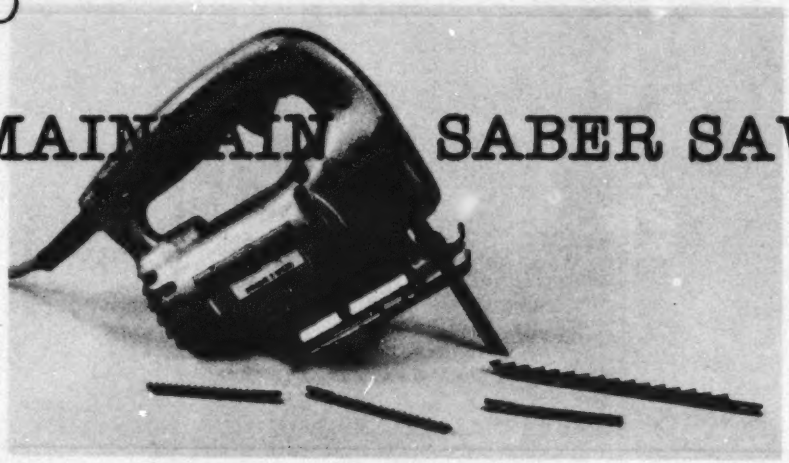
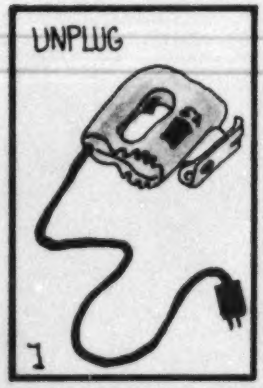
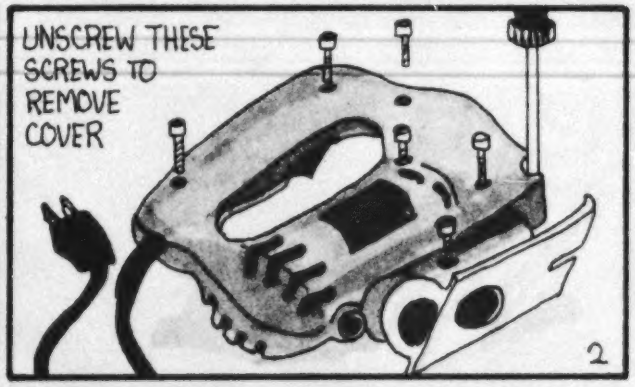
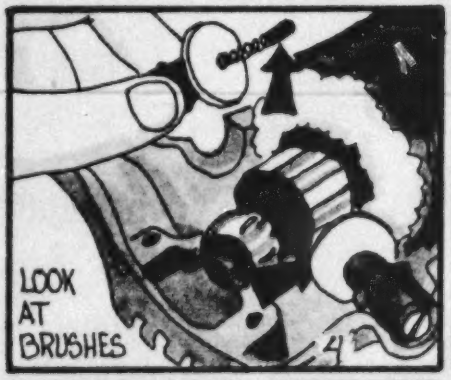


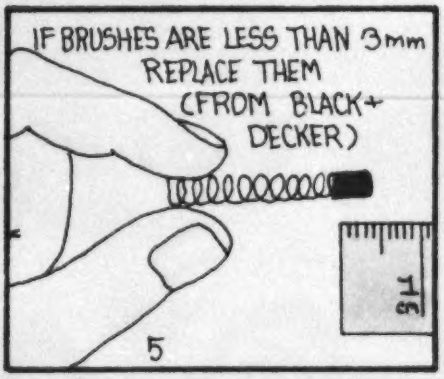
MAINTAIN SABER SAW

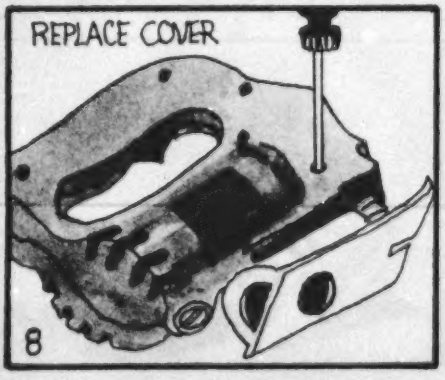
USMES
DESIGN LAB
UNIFIED SCIENCES AND MATHEMATICS FOR ELEMENTARY SCHOOLS











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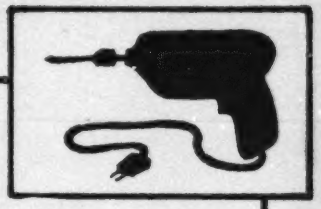
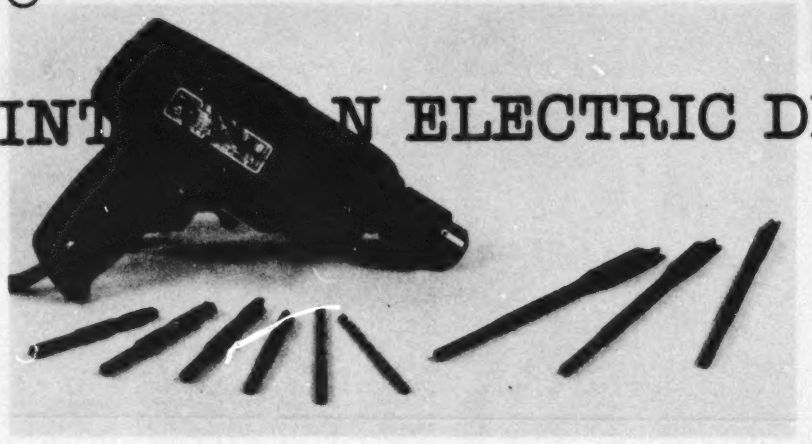


HOW TO

MAINT N ELECTRIC DRILL



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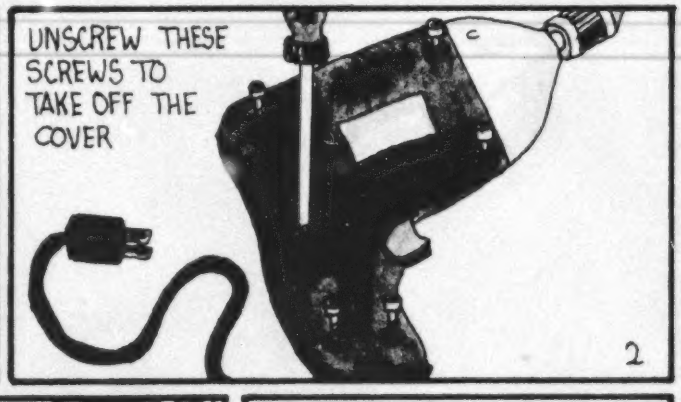

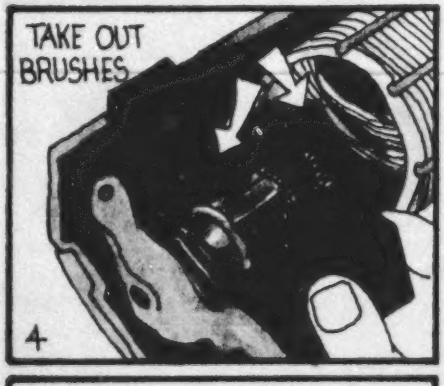

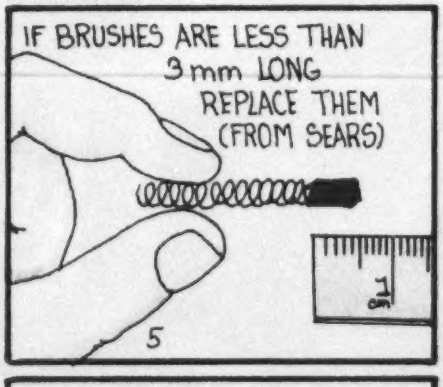

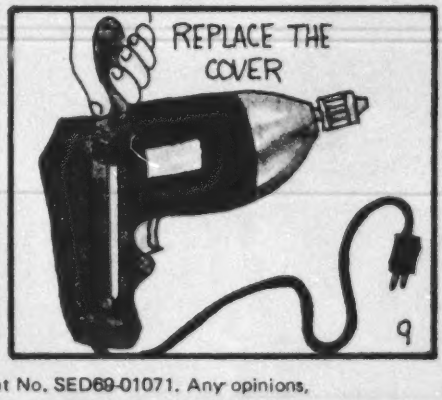

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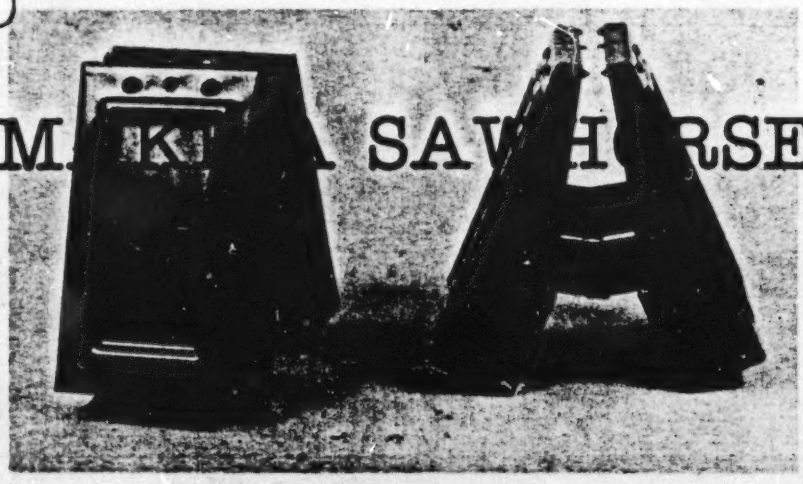
HOW TO MAKE A SAWHORSE



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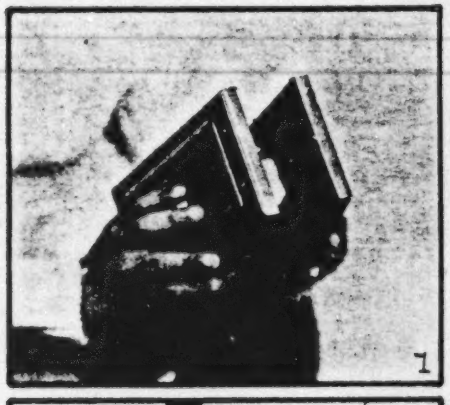
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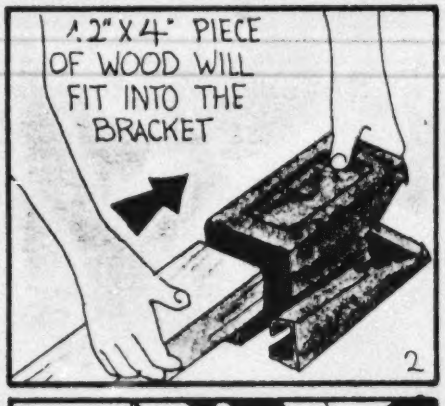

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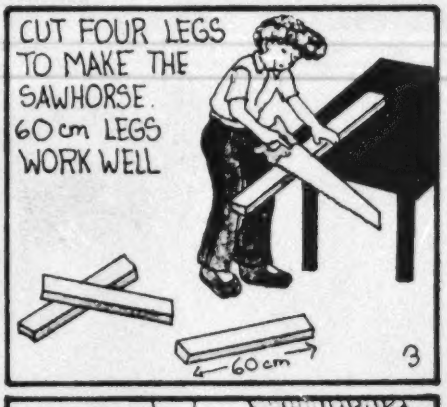

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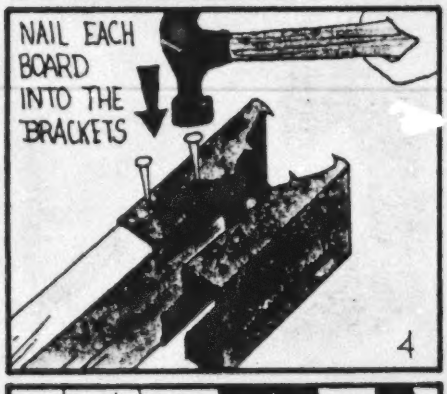

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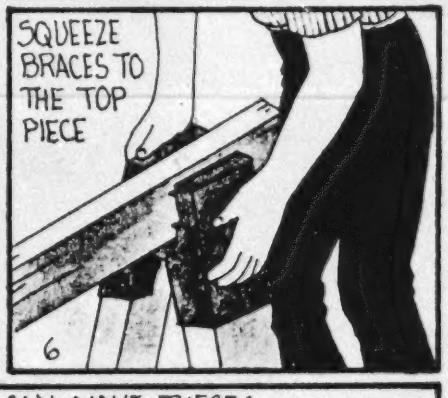

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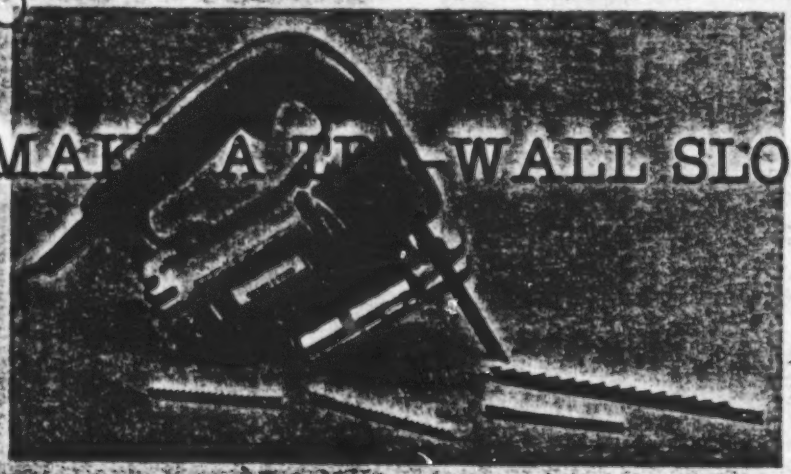

MAK[illegible] A [illegible]-WALL SLOT

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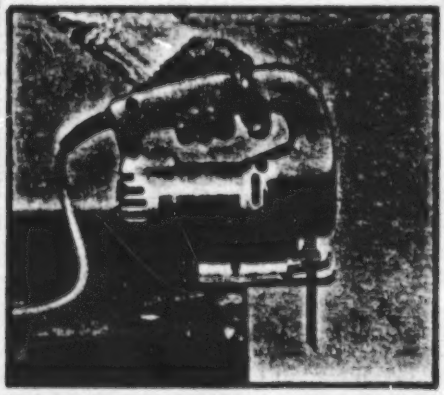

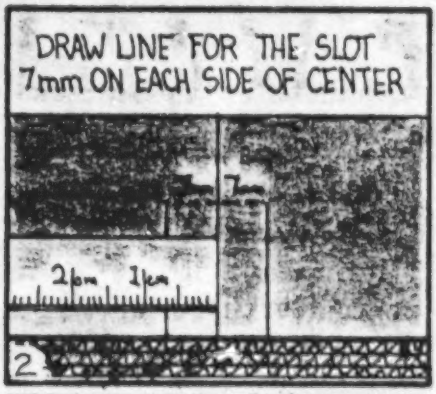

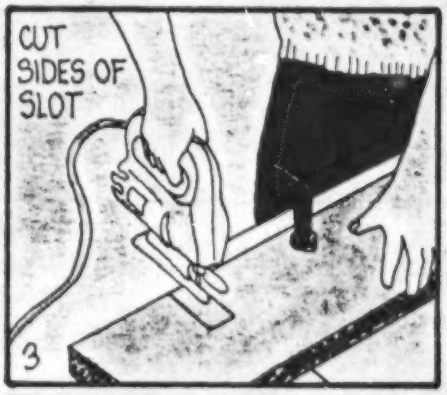

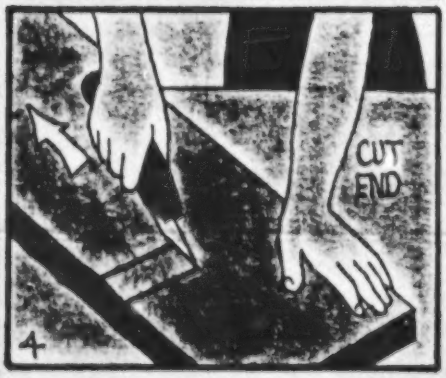

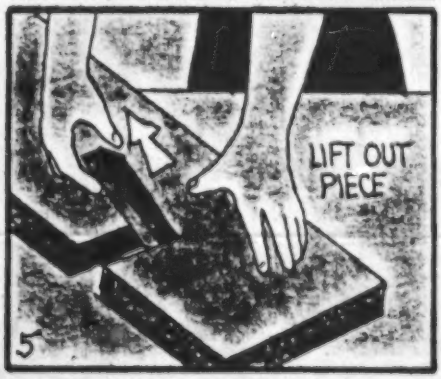

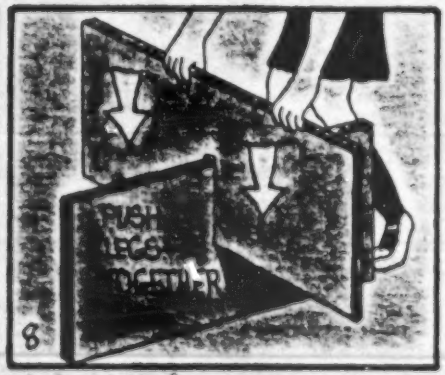

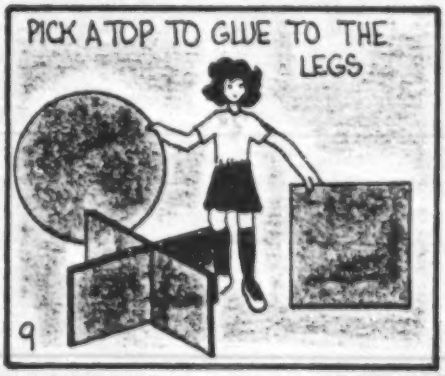

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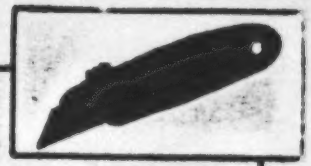
HOW TO MAKE A BEND IN TRI-WALL



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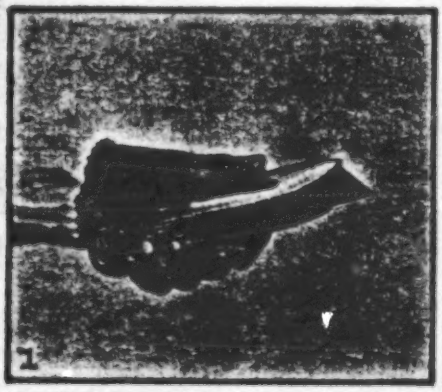

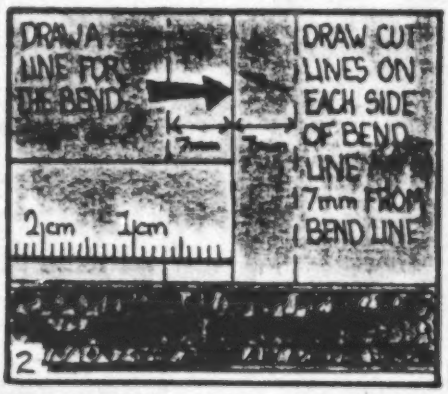

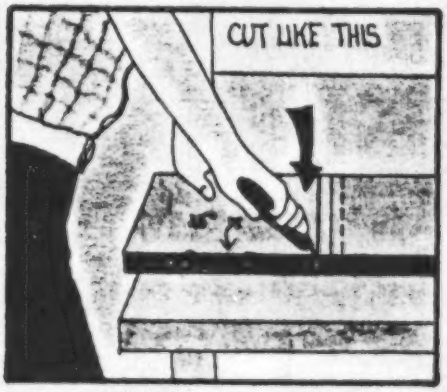

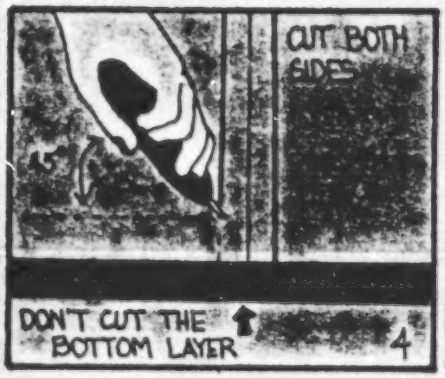

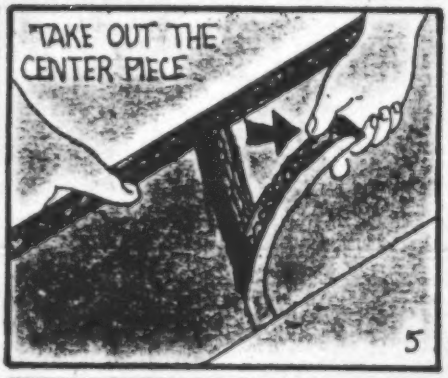

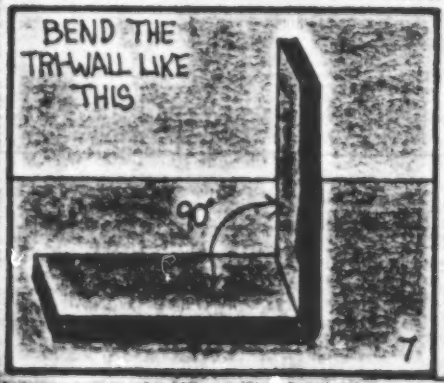

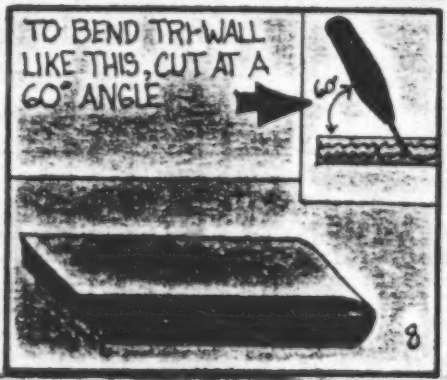

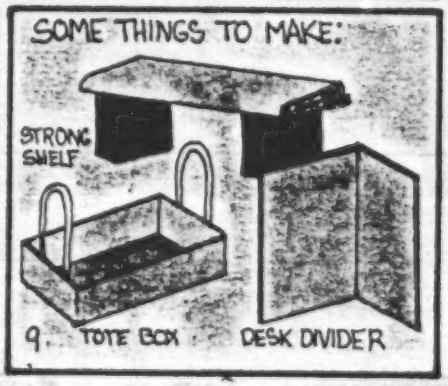

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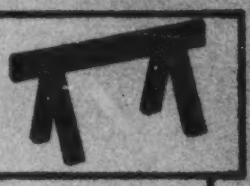

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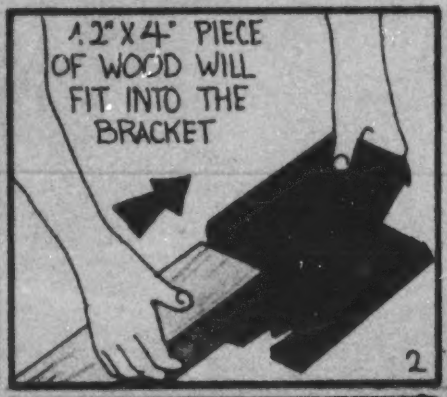

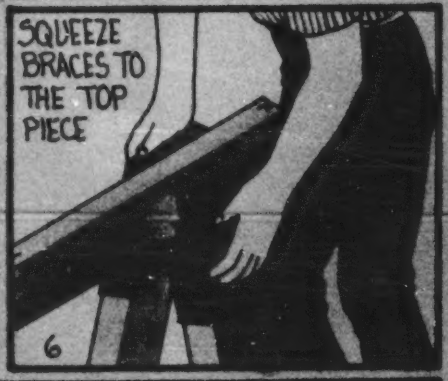

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28/A

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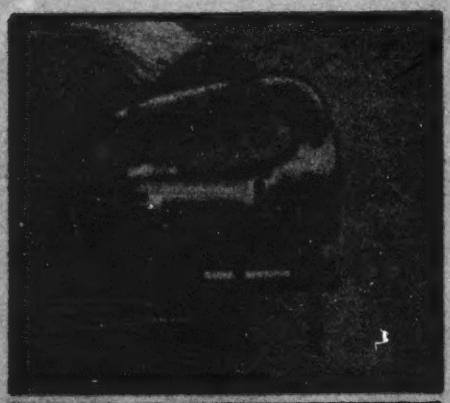

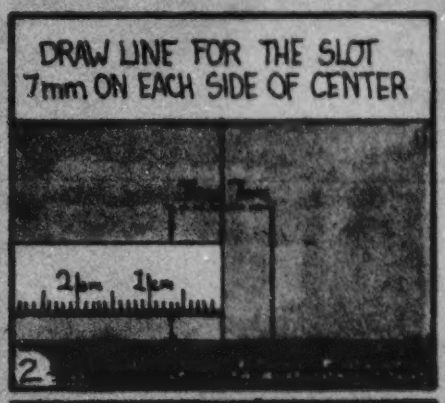

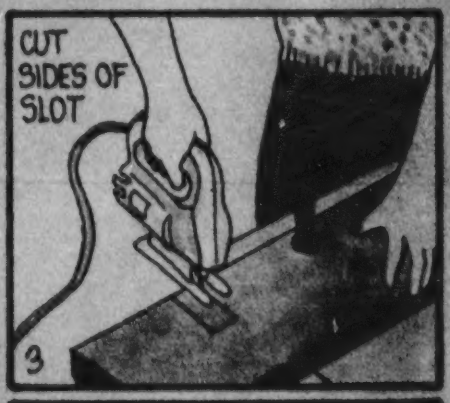

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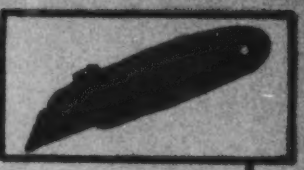
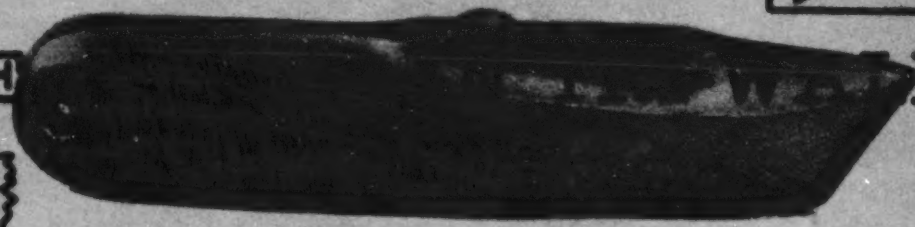
28/B

HOW TO MAKE [illegible]L





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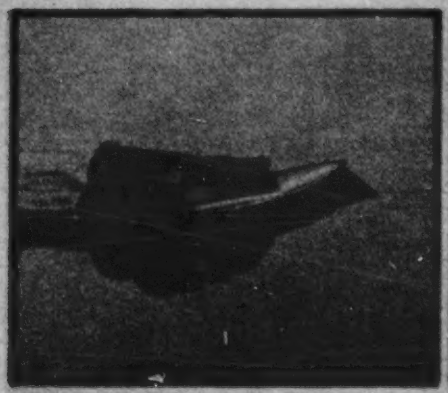

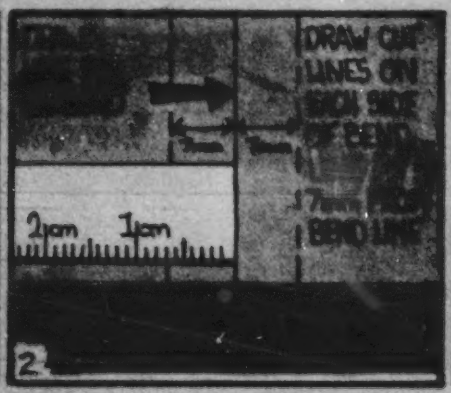

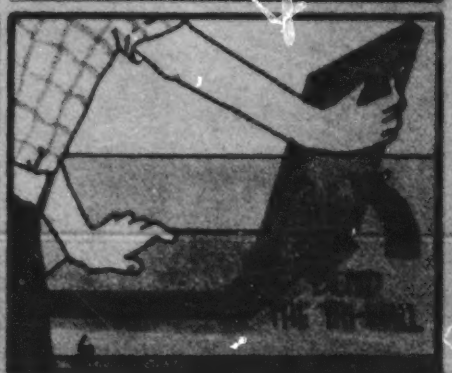

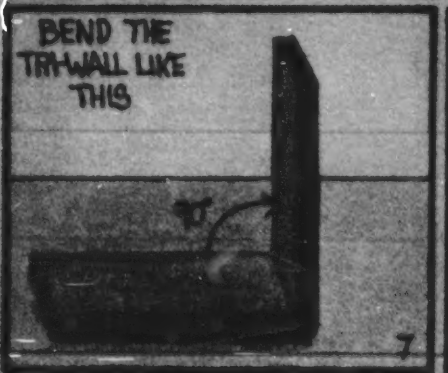

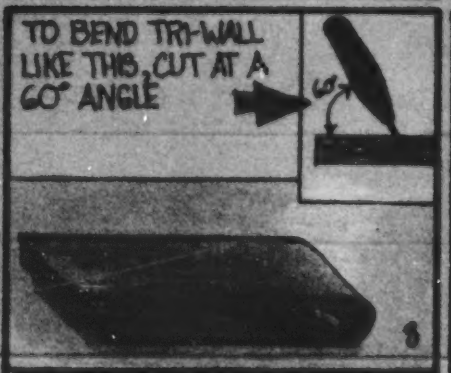

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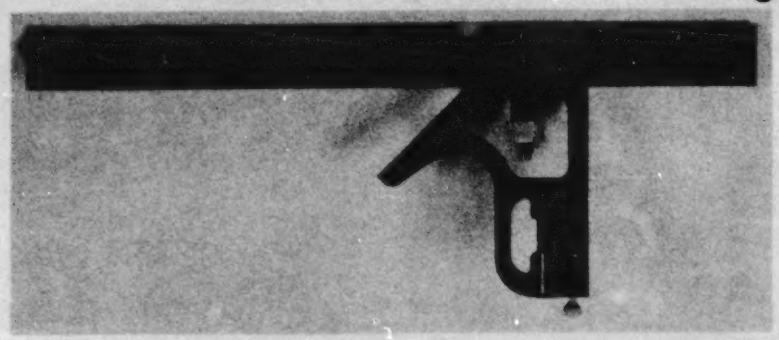
28/C.

HOW TO

USE A COMBINATION SQUARE



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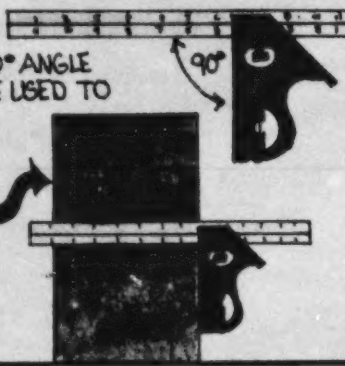

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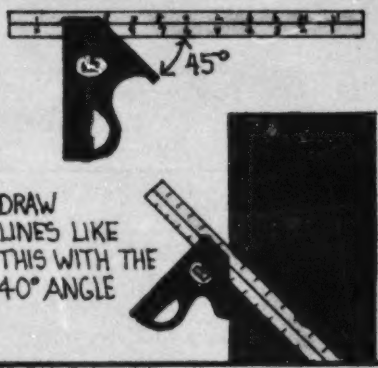

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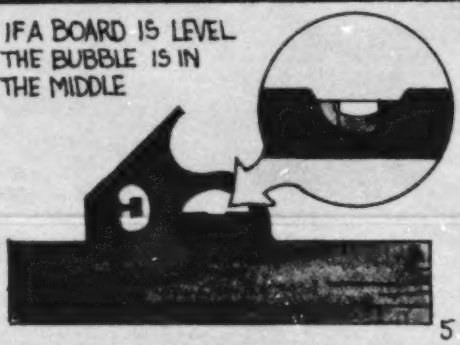

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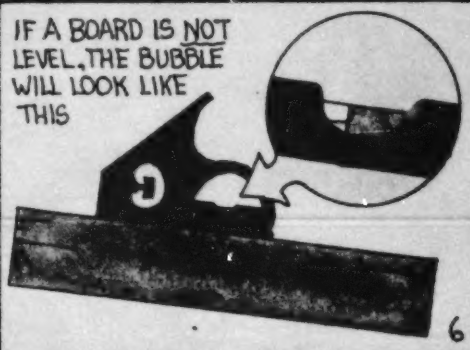

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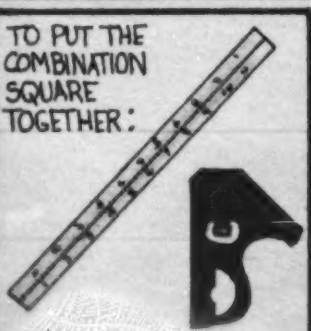

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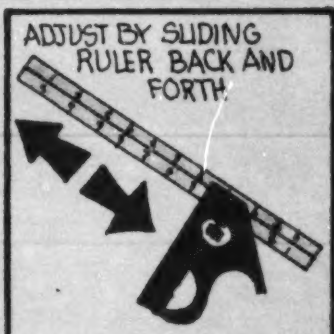

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HOW TO

USE A RAFTER SQUARE

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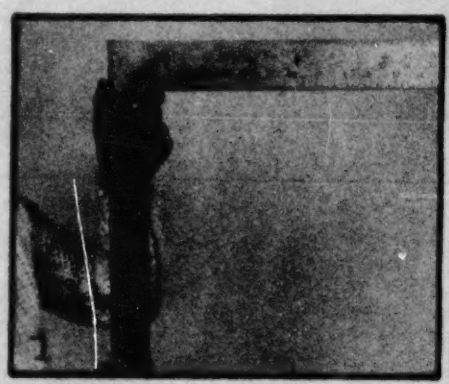

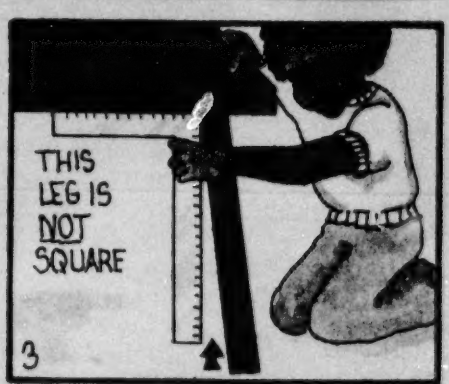

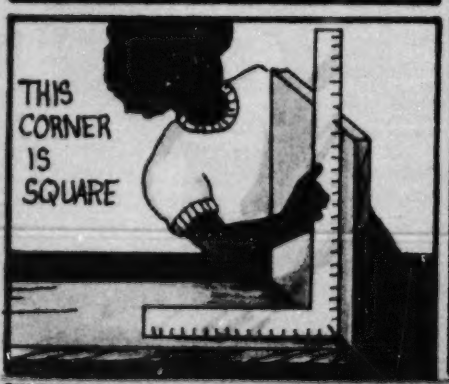

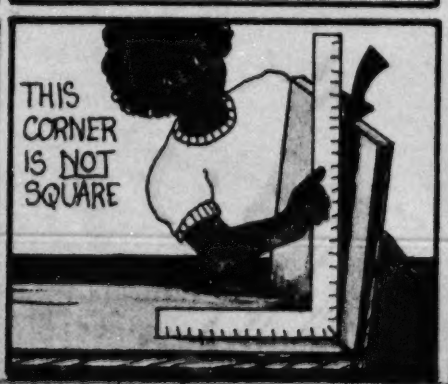

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HOW TO

USE A LEVEL

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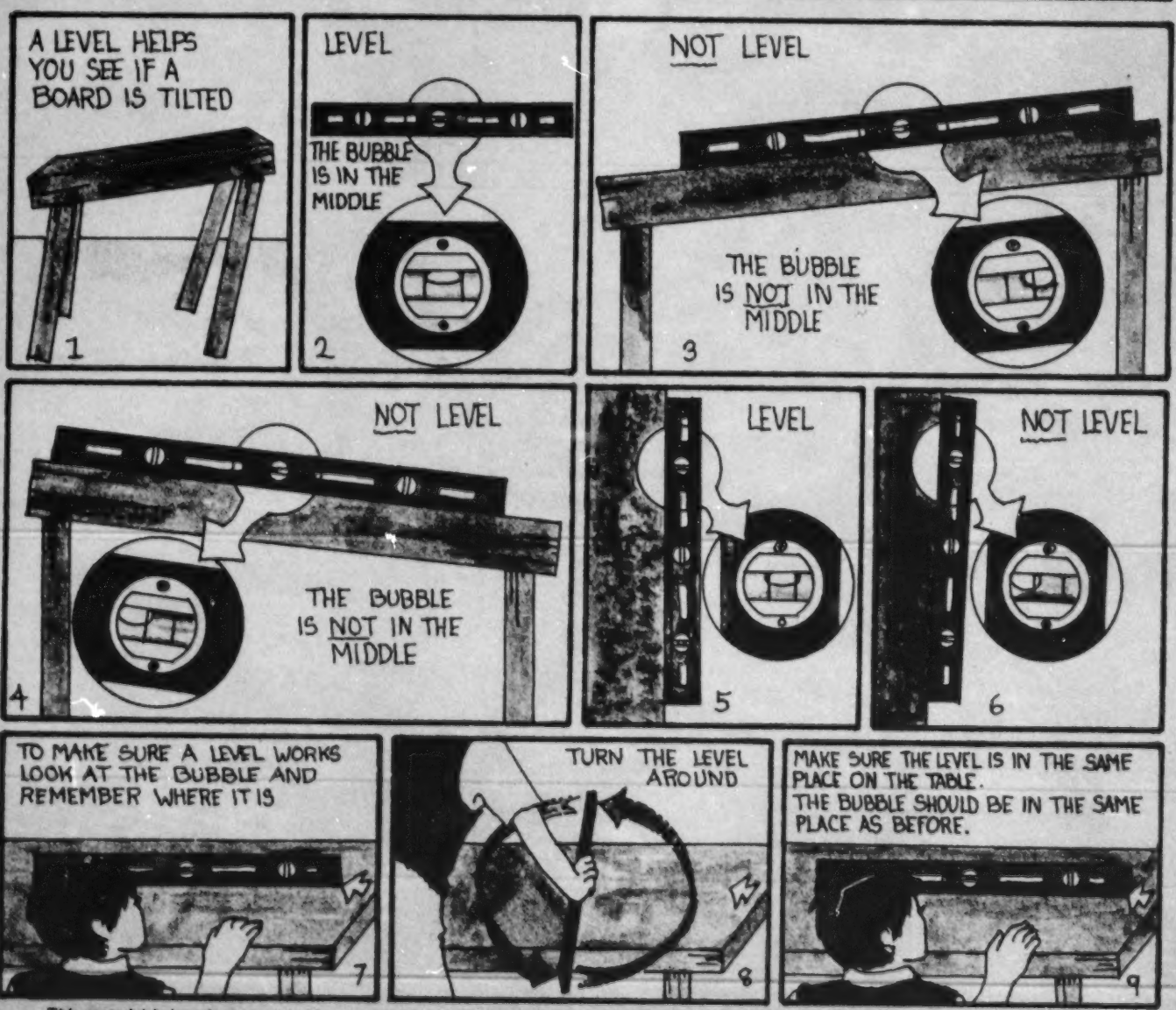
A LEVEL HELPS YOU SEE IF A BOARD IS TILTED
1
LEVEL
THE BUBBLE IS IN THE MIDDLE
2
NOT LEVEL
THE BUBBLE IS NOT IN THE MIDDLE
3
NOT LEVEL
THE BUBBLE IS NOT IN THE MIDDLE
4
LEVEL
5
NOT LEVEL
6
TO MAKE SURE A LEVEL WORKS LOOK AT THE BUBBLE AND REMEMBER WHERE IT IS
7
TURN THE LEVEL AROUND
8
MAKE SURE THE LEVEL IS IN THE SAME PLACE ON THE TABLE.
THE BUBBLE SHOULD BE IN THE SAME PLACE AS BEFORE.
9

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